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PATENT SPECIFICATION

369,782

Convention Date (Germany): May 17, 1930.

Application Date (in United Kingdom): May 6, 1931. No. 13.395/31.

Complete Accepted: March 31, 1932.

COMPLETE SPECIFICATION.

Improvements in or relating to Cooling Devices for Firearms.

I, ALEXANDER MANDL, an Austrian Citizen, of 2, Boesendorferstr., Vienna, Austria, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Firearms are known in which in order that the barrel should be kept cool it is surrounded by a metal jacket made of material (e.g. aluminium) of higher thermal conductivity than that of the barrel (steel). With the progressively increasing rate of fire and longer series of shots of firearms, such a cooling device no longer produces satisfactory results. The rate of heat exchange between the outer surface of the cooling jacket which has become warm and the air surrounding it lags behind that of the heat transmission from the barrel in the cooling jacket. Owing to its limited heat absorption capacity the heat collects in the jacket and reduces the escape of the heat from the barrel in the jacket. This results in that the barrel becomes overheated very soon, before the requisite number of rounds have been fired.

It has previously been proposed to construct radiators or cooling devices for use, for example, in connection with internal combustion engines, of two metals that differ from one another as regards their thermal properties, of copper and aluminium for example, the cylinder barrel being coated with copper in contact with which is a gilled casing of aluminium copper alloy.

Further it has been proposed in connection with the cooling of the barrels of firearms to employ a composite metal cooling jacket which is adapted to be dismounted from the barrel of the firearm.

According to this invention, which relates to cooling devices for firearms, the barrel is surrounded by a jacket formed of two metals that differ from one another as regards their thermal properties, such cooling jacket being so constructed that it can be readily disassembled from the barrel of the firearm. The groups of material thus forming the constructional material of the cooling jacket may be separate bodies detachably connected together, for instance by screws or screwed connections, or integrally connected, for instance by riveting or casting them together.

The volume and shape of the member formed from various materials may vary. They may be bodies of annular cross section extending longitudinally over the length of the barrel and arranged adjacently, one material of high thermal conductivity being always followed by another material of greater heat absorbing capacity which is in contact with the atmosphere or with a further conducting medium. When they are concentric tubular elements, the individual elements may engage within one another by means of co-operating projections and grooves (longitudinal or transverse ribs), and in the case of fixed barrels, may also thus engage with the barrel. It will generally be sufficient to form the tubular cooling jacket of two tubular shells, of which one intimately encloses the other, of which the one of material of good thermal conductivity, for instance copper, rests directly against the barrel and forms the inner layer, whilst the other of material of great heat receptivity, for instance aluminium or magnalium, forms the outer tubular member, and is preferably of considerable volume. The inner copper jacket, which may be a one-piece pipe or also of wound wire, is adapted to absorb the heat rapidly and to transmit it to the outer aluminium jacket for radiation and storage of the rest. Its higher fusing point and greater resistance to wear make the copper jacket a suitable neighbour and heat-remover for the barrel, particularly with firearms with sliding barrels.

The invention is also intended to overcome other drawbacks associated with cooling jackets consisting of one part only and which cannot be taken apart, and which are formed as a "full" jacket, and also are used with firearms with stationary barrels and also those with sliding barrels. If the cool[illegible] jacket itself had become hot it co[illegible] be removed from the weapon [illegible]

tubular body, and particularly as it was a compact mass it needed a long time to cool.

According to this invention, this difficulty is overcome in that the cooling jacket is divided longitudinally and is formed of two or more removable segmental members interconnected, or connected with the barrel. The cooling jacket constructed in this manner can be removed either as a whole or part by part from its support (barrel or weapon housing) and taken to pieces in tubular segments of small mass with large surface, or forced apart for cooling, put on one side or hung up. Thus its inner and particularly hot layers become accessible to the cooling atmosphere or cooling water poured over it; it soon becomes cool and can then be used again as a cooling jacket for a new series of rounds.

For firearms with sliding barrels it is preferable to make the cooling jacket thus formed of two or more segmental portions, elastically flexible as to their peripheries by means of connecting members elastically enclosing the segments. The individual segmental portions of the cooling jacket are thus always brought into intimate contact with the barrel, and thus the hitherto almost unavoidable air space between the barrel and the jacket which impairs the heat transmission is eliminated. This intimate contact remains without detriment to any difference of expansion between the barrel and jacket when becoming hot. The division of the jacket and its flexibility in a radial direction which facilitates unhindered expansion in a tangential direction, is particularly advantageous for jackets—as already described—composed of two materials of different thermal properties. This effectively counteracts the formation of stresses in the structure of the jacket and the jacket members formed of different materials do not change their volume owing to the changing temperatures.

The annexed drawings illustrate one form of construction of the invention; Fig. 1 is a longitudinal section, and Fig. 2 a cross section.

The barrel a is surrounded by a cooling jacket consisting of two longitudinal semi-tubular members b_1 b_2, c_1 c_2, which are held together by the rubber or spring-steel bands d which are placed around them, and of which the inner surfaces are brought into intimate contact with the barrel. The longitudinal semi-tubular members are each composed of two layers nected by rivets, an inner layer b_1 or c_1 of material of good heat conductivity, for instance copper, and an outer thick layer b_2 or c_2, having in the form of construction illustrated longitudinal ribs for increasing the radiating surface and being of material of greater heat absorption capacity, for instance aluminium. A collar a_1 of the barrel entering the annular grooves of both halves of the cooling jacket secures the latter against longitudinal displacement and against sliding away from the barrel. On firing the heat is rapidly removed from the heated barrel by the adjacent copper layer b_1, c_1 of the cooling jacket and transmitted to the outer aluminium part b_2, c_2, and is then partially accumulated and partially radiated into the atmosphere. If finally the cooling jacket itself becomes over-heated, it can easily be exchanged for a cool one. The halves of the jacket can be moved apart radially by means of heat-insulated handles, not shown, first of all from the retaining collar a_1 of the barrel, and then from the barrel as a whole or in separate parts, after removal of the spring bands d, and are put on one side for cooling, and also are forced apart.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A cooling device for firearms having a metal cooling jacket surrounding the barrel, such cooling jacket being adapted to be disassembled from the barrel and being composed of two metals differing from one another as regards their thermal properties, one of them, for instance copper, having a high coefficient of heat conductivity, and the other, for instance aluminium or magnalium, having great heat absorption capacity.

2. A cooling device for firearms having a cooling jacket surrounding the barrel according to Claim 1, characterised in that the cooling jacket is divided longitudinally and is composed of two or more segmental members so that it can be taken to pieces or forced apart.

3. A cooling device according to Claim 2, characterised in that the separate members of the cooling jacket are held together by spring bands to form a jacket and can be pressed against the outer surface of the barrel.

Dated this 6th day of May, 1931.

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Machine-gun Cooling

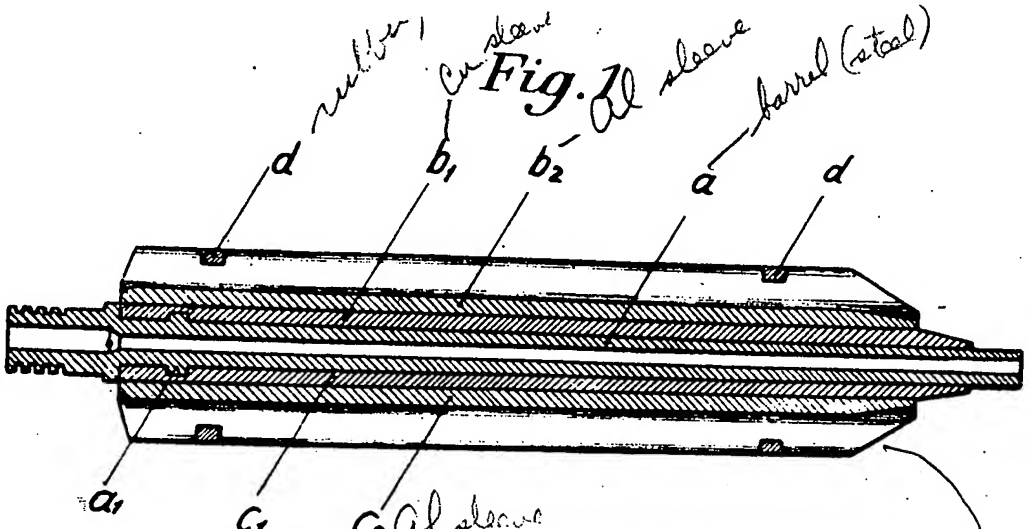

Fig. 1.

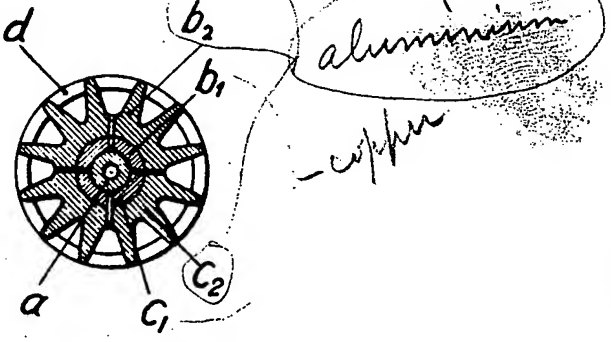

Fig. 2.

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